

The Development of Creative Thinking Skills among Senior Secondary Biology Students in Jos North, Plateau State

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Abstract

The purpose of the study was to examine the trend of development of creative thinking skills among secondary school Biology students. The study was a survey; data was collected by giving a test on creative thinking in Biology. The population comprised Senior Secondary 2 Biology students in public secondary schools in Plateau State, Nigeria. The sample was 180 students who were selected using the purposive sampling technique. The test items were in the domains of fluency, flexibility, originality and elaboration. The results from the analysis showed that the percentage creative thinking skills in the four domains are fluency (49.45%), flexibility (17.65%), originality (11.25%) and elaboration (21.65%). The higher percentage was observed in fluency while the lower percentage was observed in originality. The conclusion drawn from the study is that the development of creative thinking skills among senior secondary 2 students was relatively low. It is recommended that deliberate effort should be made by Biology teachers to inculcate into the pedagogy creative thinking strategies that will enhance creative thinking skills of the students during the teaching and learning process.

Introduction

The quest for improving achievement in Biology and enhance creative thinking skills as a science process for development of the mental capacity of students during pedagogy to be innovative in thought is on the front burner of pedagogy. This is so as to birth creativity in proffering solutions to problems by exploring strategic ways of improving pedagogy in high schools. Consequently, innovative ways of teaching and learning are constantly being sought to meet the challenges of the myriad of problems of development, job creation and productivity of the society. According to Makkar and Sharma (2020), creative thinking skills are being emphasized in the 21st century and are considered as the ability of a person to use creative thinking to invent and develop new ideas based on originality during the knowledge acquisition process (pedagogy). It is imperative to note that developing creative thinking skills and abilities in students during pedagogy demands deliberate, strategic and innovative ways of dispensing knowledge in the classroom. The National Policy on Education emphasized the development and application of skills by teachers so as to transfer meaningful learning to the students (Federal Republic of Nigeria, 2014). Kareem and Adeleke, (2020) assert that this will help to facilitate development through industrialization which in turn will help improve the quality of life of the people. In line with the above thoughts, Teng (2012) added that

generalized science like Biology is needed to make informed decisions so as to make it impactful in order to aid national development.

Creative thinking is one of the most important skills of the 21st Century and students are demanded to not only be able to solve the cognitive problems, but also to face the life problems (Nurhamidah, Masykyuri & Dwiastuti, 2018). According to Natalia (2021), creative thinking skills should be developed in all possible contexts and should take into account the personal characteristics of each student, so that the students are able to generate creative products in a variety of contexts. Teachers then have an Allimportant role in developing creative thinking in students during pedagogy because learning had hitherto emphasized intelligence and paid less attention to creative thinking. Students learning Biology in school should be practicing their thinking skills alongside the learning process so as to obtain, analyze and evaluate information into productive use to be able to survive in a dynamic and competitive environment. Job availability and job creation are challenges many nations are grappling with and every year students' graduate from institutions into a society that has limited jobs for them therefore, frustration and depression may set in as a consequence. The development of creative thinking among students has become imperative for nations if the challenges of job creation are to be solved.

Creative thinking skills can be developed using active and creative learning strategies that



AJSTME, Volume 8, Issue 5. 375-379, July, 2022. ISSN: 2251-0141

engage students in mental exercises, which will enable the students to practice their skills in problem-solving from different perspectives and to utilize the knowledge acquired during pedagogy for meaningful and productive purposes thereby adding value to society. The potency of creative thinking among secondary school Biology students is such that when armed with the requisite creative thinking skills at that level of life, it is hoped that this skill will mature as the students grow and develop. When confronted with challenges, the students would have been well prepared to face complex situations and problems in everyday life thus reducing the burden on society.

The study used open ended questions drawn from the Biology curriculum and the students were required to provide responses to the questions from the perspectives of creative thinking; by giving logical solutions to challenges in the society that stem from the content areas in the curriculum. The students were expected to engage in mental exercises and not referenced to ready-made study materials, so as to elicit the creativity inherent in the students which has not been tapped or utilized. Doing this during pedagogy will boost students' confidence in the subject and give them a wide latitude to explore so as to come up with solutions whenever situations demand for it.

Objectives of the Study

The objective of the study was to examine the trend of development of creative thinking skills among secondary school Biology students with emphasis on the domains of fluency, flexibility, originality and elaboration.

The following research questions guided the study;

- 1. What is the trend of development of creative thinking skills of secondary school Biology students?
- 2. In which domains of creative thinking are Biology students excelling?
- 3. In which domains of creative thinking are Biology students having difficulty?
- 4. What is the relationship between creative thinking and students' achievement in Biology?

Methods

This study was a survey using a test method. The survey design using the test method was chosen to describe the percentage of creative thinking skills of Senior Secondary 2 Biology students from their responses to the questions in the creative thinking test. The sample for the study was 180 senior secondary 2 Biology students: the researchers used purposive sampling technique to select the sample size for the study to represent the population in the study area. The students were given a test to analyze their creative thinking skills in Biology in the domains of fluency, flexibility, originality and elaboration.

Fluency is the number of original or text book answers that the students will provide; flexibility is the ability of the students to change tact or to consider alternative approaches to answering questions if it is not efficient, originality is the answers provided by the students which are rare or not routine answers from text books while elaboration is the details of the ideas of the students from independent thought.

The test used open-ended questions based on indicators of creative thinking skills, validated by a team of experts of Research Measurement and Evaluation from the University of Jos, Nigeria and the test instrument had a reliability index of 0.94 making it reliable to be used for conducting the study. Four items were developed on each domain, and the questions were drawn from the Senior Secondary 2 Biology curriculum taken from the topics Tissues and Supporting Systems, Regulation of the Internal Environment, Ecology and Pollution. A table of specification was developed for the test and the data collected from the test results was analyzed using descriptive percentage to find out the indicators of creative thinking skills that could not be achieved by the students. The raw scores of the test were analyzed in percentages to ascertain the performance of the students in the four domains of creative thinking and the results are presented below.

Results

Table 1: Table of specification for the creative thinking test								
Content	No of Questions	Kn	Com.	Арр.	Ana.	Syn.	Eva.	Total
Fluency	4				2	1	1	4



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ISSN: 2251-0141				

Flexibility	4				1	2	1	4	
Originality	4				1	1	2	4	
Elaboration	4	2	1	1				4	
Total	16							16	

Table 2: Percentage score for creative thinking aspects
based on fluency, flexibility, originality and
elaboration collated from the raw scores of the creative

thinking	test
unning	1001

Domain	Percentage
Fluency	49.45
Flexibility	17.65
Originality	11.25
Elaboration	21.65
Total	

Table 3: Creative thinking Skills Levels

Criteria	Percentage
Very High (VH)	81-100
High (H)	61-80
Sufficient (S)	40-59
Low (L)	20-39
Very Low (VL)	0-19

The results from the analysis showed that the percentage creative thinking skills in the four domains are fluency (49.45%), flexibility (17.65%), originality (11.25%) and elaboration (21.65%). The highest percentage was seen in fluency while the lowest percentage in the analysis was in originality. The possible reason of this result is that; students merely focus on gaining one correct answer for a problem (convergent thinking) and have not used divergent thinking to find solutions to problems. This result is further strengthened by what Diki (2013) wrote about the development of creative thinking skill; that creative thinking skill is underestimated in formal education although creativity is meaningful to develop children's potential. All this time, formal education only appreciates more on convergent thinking rather than divergent thinking.

Discussion

Creativity as a result of creative thinking process has been acknowledged as an important role to boost innovation and as a main factor to develop a person's competency. Creative thinking is mostly used broadly and considered as a skill, like 'creative thinking' or 'creative problem solving' and creative thinking skills can be empowered through teacher training and the learning environment which encourages questions, open mindedness to new ideas, and readiness to learn from mistakes and failures. Studies on creative thinking measurement have not been conducted much, but should be encouraged if the quest for governments to solve the problems associated with population increase and job creation is to be actualized. Unfortunately, creative thinking strategies in pedagogy have not been emphasized in the classroom or even if it has, it is not adequately emphasized as evidenced from the results of the study conducted. Students are more comfortable with the fluency domain and do not do very well in the domains of flexibility and originality where creative thinking is used to analyze and evaluate situations so as to proffer solutions to problems.

The students from the results of the study appeared to be more comfortable with the fluency domain where the students were expected to give feedback responses from the ready-made study materials they had. This makes learning rigid and not flexible to allow for creative thinking as Oommen (2015) wrote that; many students gain little new knowledge from traditional lectures because these methods of teaching engender passive learning rather than active engagement, boredom instead of intellectual excitement, and linear thinking rather than cognitive flexibility. Haider (2012) also observed in a study that students are too dependent on ready-made materials like textbooks and they rarely engage in creative thinking to find solutions to problems. When these ready-made materials are not handy, achievement in tasks becomes a challenge for the students because they do not develop the mental capacities to think creatively when given tasks and so, tend to perform poorly when the tasks require them to think creatively to find solutions to problems (Orzoco & Yangco, 2016).

According to Nurhamidah, et al., (2018), the twenty-first century is an era which is dominated by knowledge of brain development because humans rely on their brain as a source for thinking skills, for developing life skills, life competencies, or specific skills in solving global problems. Therefore, science learning and in this case, Biology learning entails that



students should be creative in thinking as globalization has thrown so many challenges at life, and the means to successful living cannot be attained if the students are limited to the fluency domain of creative thinking during pedagogy as the results of this study suggests.

The low level of creative thinking may be caused by schools' curriculum which merely focuses on convergent thinking processes that are limited to verbal reasoning and logical thinking. Therefore, students just get used to convergent thinking and if there are problems which require creative thinking to solve, the students will have difficulties in solving the problem due to lack of creativity. Also, learning processes at school focus on memorization because of the vast number of ready-made study materials available. This type of learning process will not develop students' creative thinking skill and hence, their productivity which could add value to national life. It is therefore imperative that creative thinking strategies should be inculcated in the Biology curriculum so that, the students are exposed to divergent ways of thinking and so develop the creative thinking skills which could enhance productivity that can add value to the society when aggregated with other fields of endeavor.

Creative thinking skill can be nurtured by giving chances for the students to think and bravely state the new ideas they have come up with based on their interests and needs. The foregoing indicates that, every individual has their own creative thinking skill level and this skill can be enhanced with the right strategies or learning models and developed from one level to the higher level of proficiency.

Conclusion

Based on the findings of this study, it is evident that the development of creative thinking skills among secondary school Biology students has been inadequate and as a consequence, students do not utilize knowledge acquired during pedagogy to be creative in finding solutions to problems. The study revealed that secondary school Biology students are more comfortable with convergent thinking in the fluency domain rather than divergent thinking in the flexibility and originality domains. It is pertinent to state that, creative thinking in Biology helps students to formulate novel and useful ideas which when applied to everyday life can help students solve their own problems. Creative thinking needs to be developed in the students therefore, students need practice in the skills as pedagogy is going on. Learning activities need to deliberately include strategies that would develop creative thinking skills in students so that the students can also solve their own problems in Biology.

It is therefore recommended that curriculum planners and Biology educators should begin to devise strategies to be inculcated in pedagogy that could develop the creative thinking skills of Biology students to enhance the students' learning of the subject and subsequently enhance the productivity of the students to participate in national development.

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AJSTME, Volume 8, Issue 5. 375-379, July, 2022. ISSN: 2251-0141

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